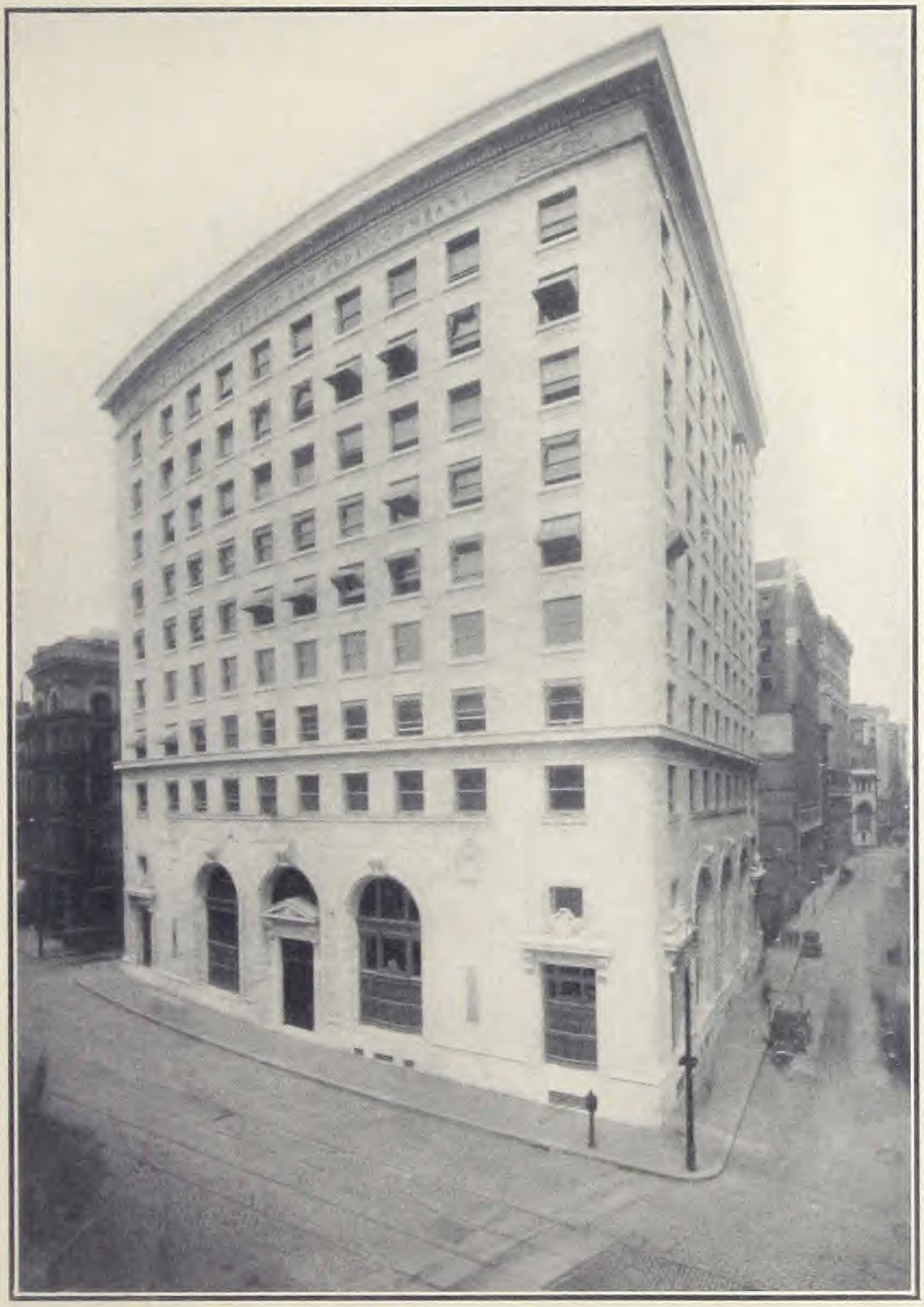
WEBSTER MODULATION STEAM HEATING

AND AIR WASHING SYSTEMS IN THE
BOSTON SAFE DEPOSIT AND
TRUST CO. BUILDING



WARREN WEBSTER & CO.
CAMDEN, NEW JERSEY

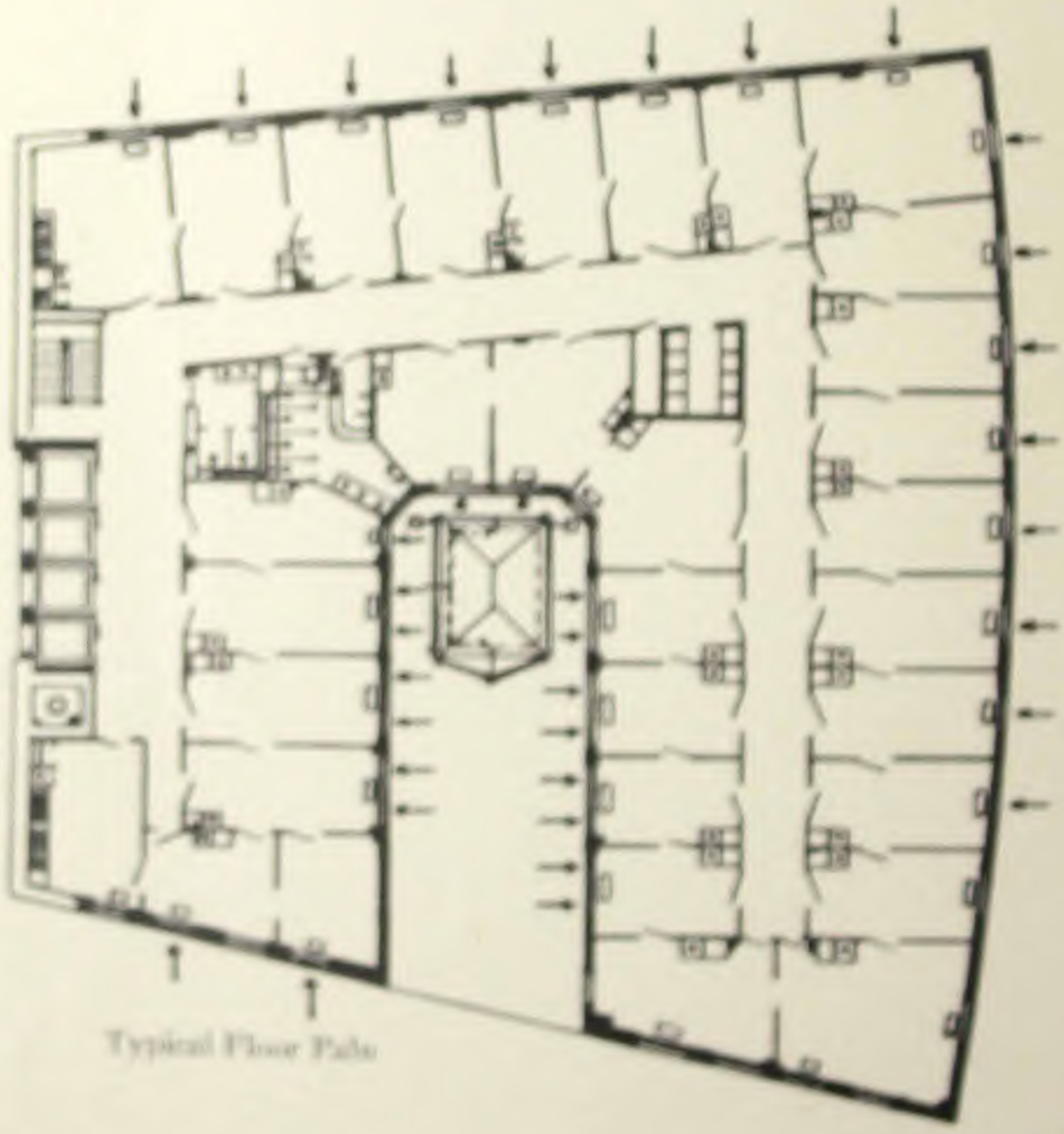
Webster Modulation and Air Washing Systems in the Boston Safe Deposit and Trust Company Building

AMONG the many fine additions to its banking buildings that the city of Boston has made recently, none is more noteworthy than the latest of these structures, the new building of the Boston Safe Deposit and Trust Co. Located on Franklin Street and occupying the block between Devonshire and Arch streets, this new bank building with its ten stories of white Dorset marble is one of the most imposing business blocks in the city. The exterior design is severely plain on lines somewhat suggestive of the Italian Renaissance. The interior is remarkable not only for its artistic and architectural features, but also for the care displayed throughout for the comfort and convenience of the occupants. The main floor and basement, as well as a mezzanine, are devoted to the offices and banking rooms of the Trust Company and its safe deposit vaults. The latter department is housed by itself in the basement—vaults, coupon rooms, etc., being provided. The sub-basement contains the power plant, a laboratory and various storage rooms. The entire eight upper stories are devoted to rented offices.

In this building there are two distinct systems of heating and ventilation, a Webster Modulation Steam Heating System, arranged for the most part for direct-indirect heating, supplying the offices on the upper floors, and an indirect fan system equipped with a Webster Air Washer, furnishing pure, fresh and warm air for the banking department. The radiators in the corridors are arranged for direct heating, but wherever possible in the offices an ingenious indirect system is applied to the radiators, thus supplying fresh and at the same time heated air.

The fresh air intake for the main indirect fan system is located over one of the main entrances at a height of about fifteen feet from the sidewalk. From this intake a brick flue next to the wall leads down to a concrete duct under the sub-basement floor, through which the fresh air is conveyed to the air washer and thence to the main ventilating fan. The latter is situated on the sub-basement floor, and a short vertical duct from the main fresh-air duct carries the air through a grating in the floor to the tempering coil at the entrance to the air washer. This tempering coil contains 2868 linear feet of one-inch pipe, through which steam passes to raise the temperature of the air before it enters the Webster Air Washer. Between the air washer and the ventilating fan is located a reheater containing 4780 linear feet of one-inch pipe.

The Webster Air Washer has a capacity of 40,000 cubic feet of air per minute and is built of 18-ounce cold-rolled



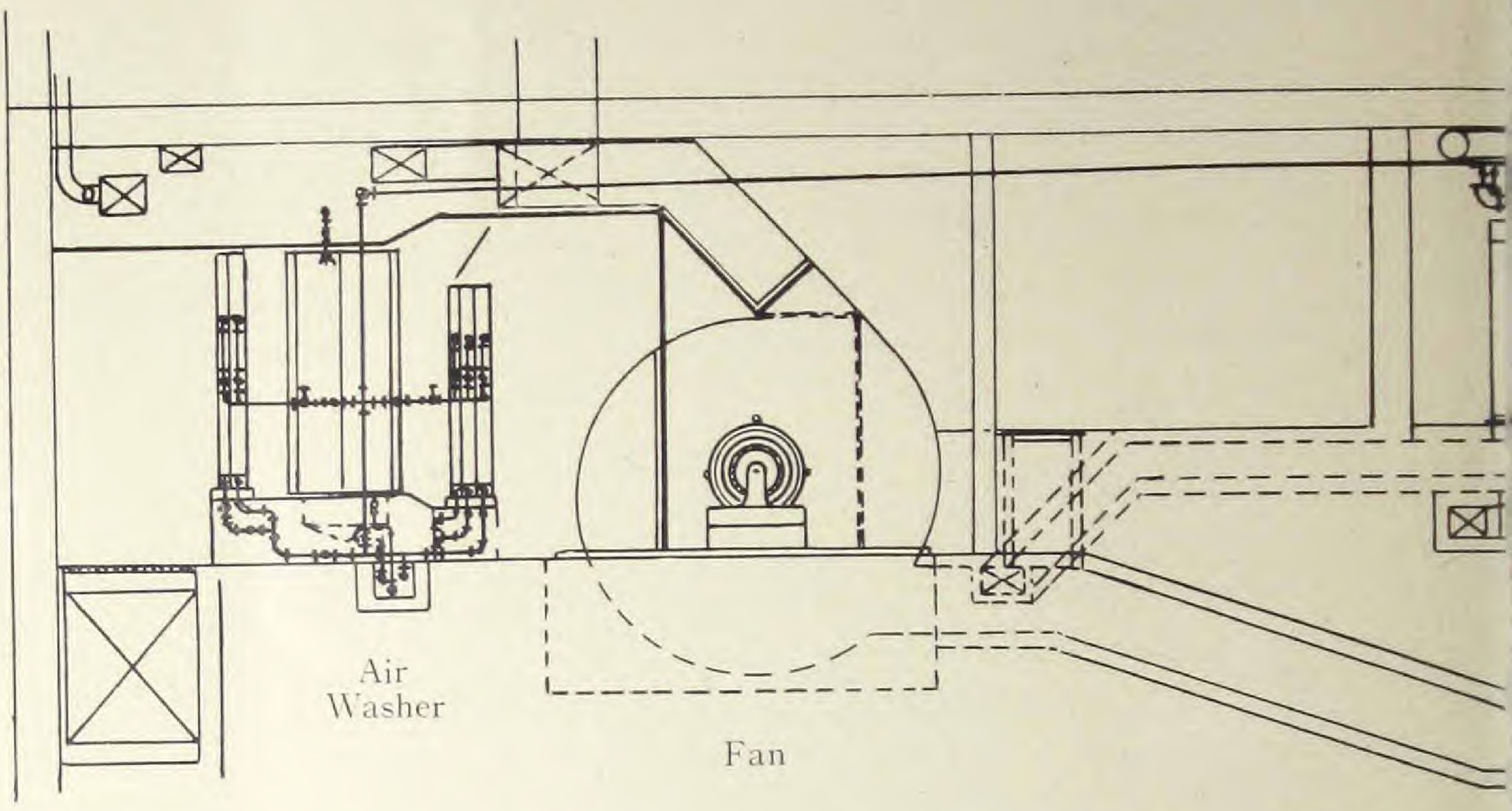
Typical Floor Paln

copper braced with 1½″x 1½″x 3/16″ angle irons. The air washer consists of a spray chamber containing the Webster Spray Device and an eliminator chamber. The spray device, which extends across the top of the spray chamber, is made of a brass pipe, covered by a copper hood, and having water discharge openings 7/32″ in diameter. The spray water is discharged from these openings in such a manner that a double sheet of water is formed, through which all the air must pass before being delivered to the banking rooms. The spray water falls into a concrete tank below and is recirculated by means of a 2½″ brass fitted Tacony turbine pump driven by a direct-connected 7½ H.P. motor running at 1500 R.P.M.

After passing through the spray water all free moisture is removed by the eliminator. The eliminator baffles are built of copper in "V" shape and with an extended lower edge and stiffened along the upper edges by being bent so as to form a hook or lip and thus increase the separating or eliminating efficiency. The baffles are slightly inclined from the horizontal, the "V"-shaped interior forming a passage for draining the entrained water and dirt extracted from the air to a vertical gutter, thence into the tank below. On leaving the air washer the air passes through the reheater, where it is warmed to the temperature required, and then it is distributed to various parts of the bank and the safe deposit vaults by means of a series of galvanized iron ducts.

In conjunction with the main pressure ventilating system there is an exhaust system provided. Upon the roof of the building is located a steel plate fan which is fed by a series of galvanized iron ducts converging to a central riser leading to the roof. These ducts originate in various sections of the banking quarters and serve to take out the vitiated air. There is also an independent exhaust system for ventilating the closets, toilets and lockers. Small ducts concealed in fixtures lead to a main riser similar to that for the main exhaust system and a small fan on the roof draws out the impure air. Both roof fans are remote—controlled from the engine room.

In order to provide fresh air for the attendants in the boiler, engine and pump rooms, a special system of pressure ventilation is provided for the sub-basement. A downtake similar to that of the main fan system brings fresh air to a

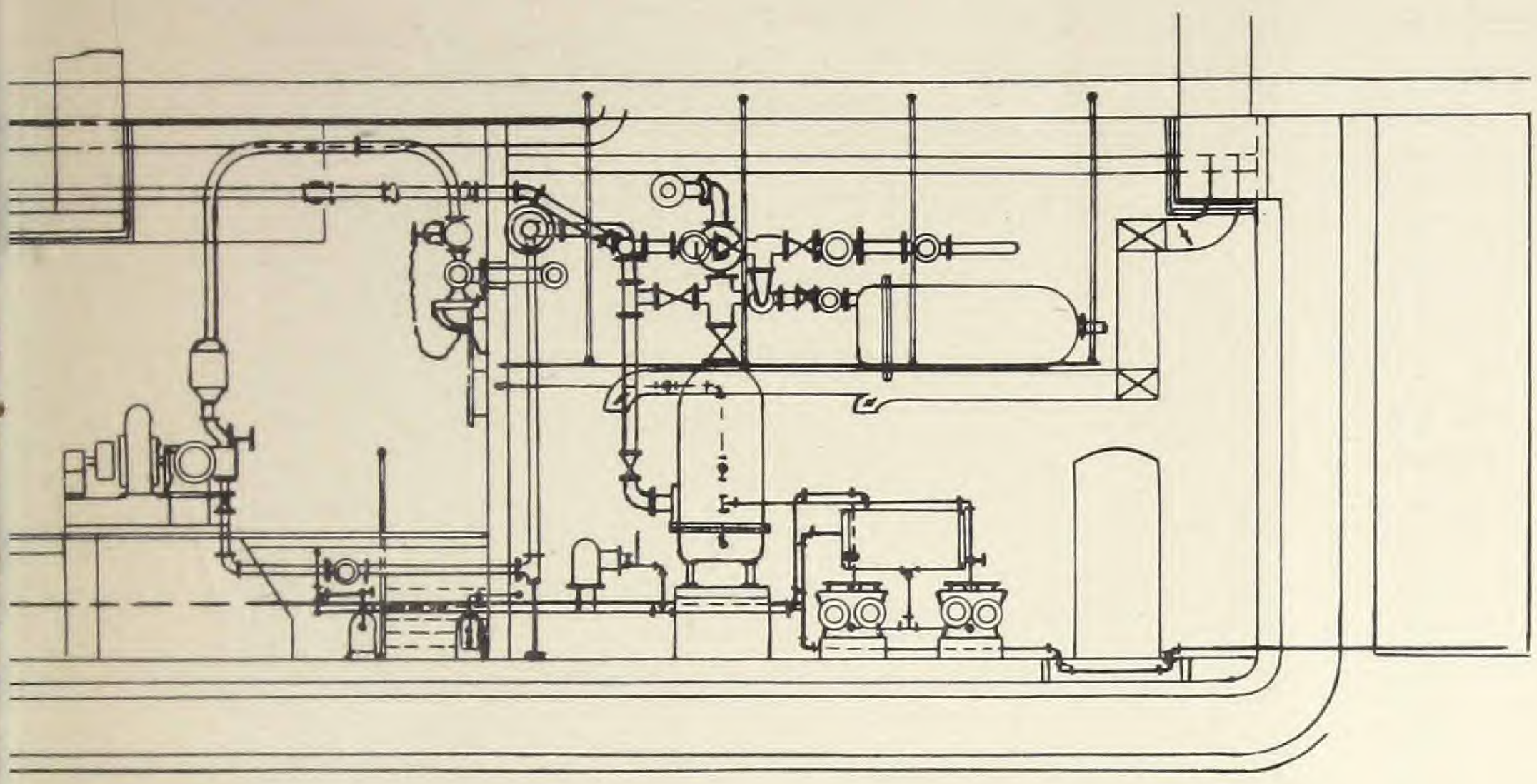


Sectional Elevation of Sub-Baseme

steel plate fan having a capacity of 12,700 cubic feet per minute, which distributes the air. This fan is direct driven by a 6 H.P. motor which runs at 315 R.P.M.

The operation of the indirect system has proven most successful, not only in providing a sufficient quantity of warm air during the winter and in extracting the used-up air from the bank, but also in furnishing relatively cool air in the summer. It has been possible by means of the Webster Air Washer to reduce the temperature of the bank in warm weather at least ten degrees below that obtaining outdoors. In order to bring about this result, it is customary during the summer to keep all windows closed, and revolving doors suffice to keep out any large amount of air due to the passage of people in and out of the bank. It is reported that the Webster Air Washer has required practically no attention since its installation beyond starting and stopping the centrifugal pump and flushing out the tank once a week. The engineer of the Safe Deposit Building said recently that he had had no trouble whatsoever due to the spray head clogging. This is because of the generous proportions of the spray head openings provided in the Webster Air Washer.

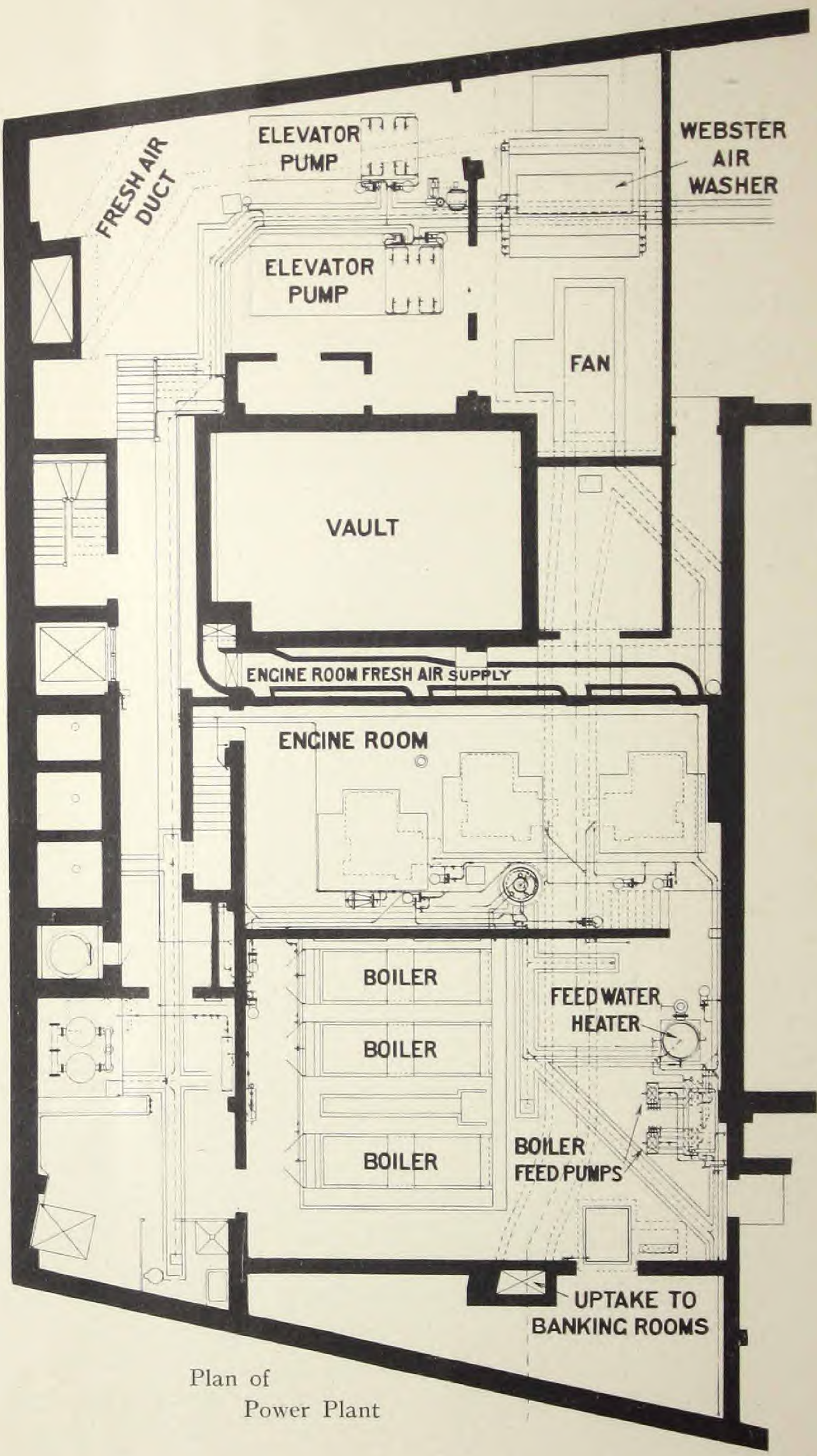
The Modulation System of Steam Heating has been installed throughout the upper eight floors of the building as well as in the corridors on the main floor. There are in



owing Webster Air Washer and Fan

all 11,960 square feet of surface divided among 320 radiators connected to this system. In almost all of the offices it was possible to provide for the use of the direct-indirect system. Fresh-air intakes are provided in each room, a narrow slot 2″ x 20″ extending through the wall just beneath each window provided with a radiator. This horizontal duct opens into a similar duct descending vertically inside the plaster to the baseboard, where a right angle turn brings the air out at the base of the radiator. A shut-off damper is provided near the intake of the horizontal duct, which is operated by means of a knob on the wall located conveniently just above the radiator. A deflecting damper in the radiator base causes the incoming air to flow upward over the radiator sections and thus become heated to a comfortable temperature. This upward flow of the heated air induces a chimney action which assures circulation through the duct. The base damper is adjustable so that any amount of fresh air may be obtained up to the capacity of the duct. Either damper may be closed and the radiator then operated as an ordinary direct heating unit.

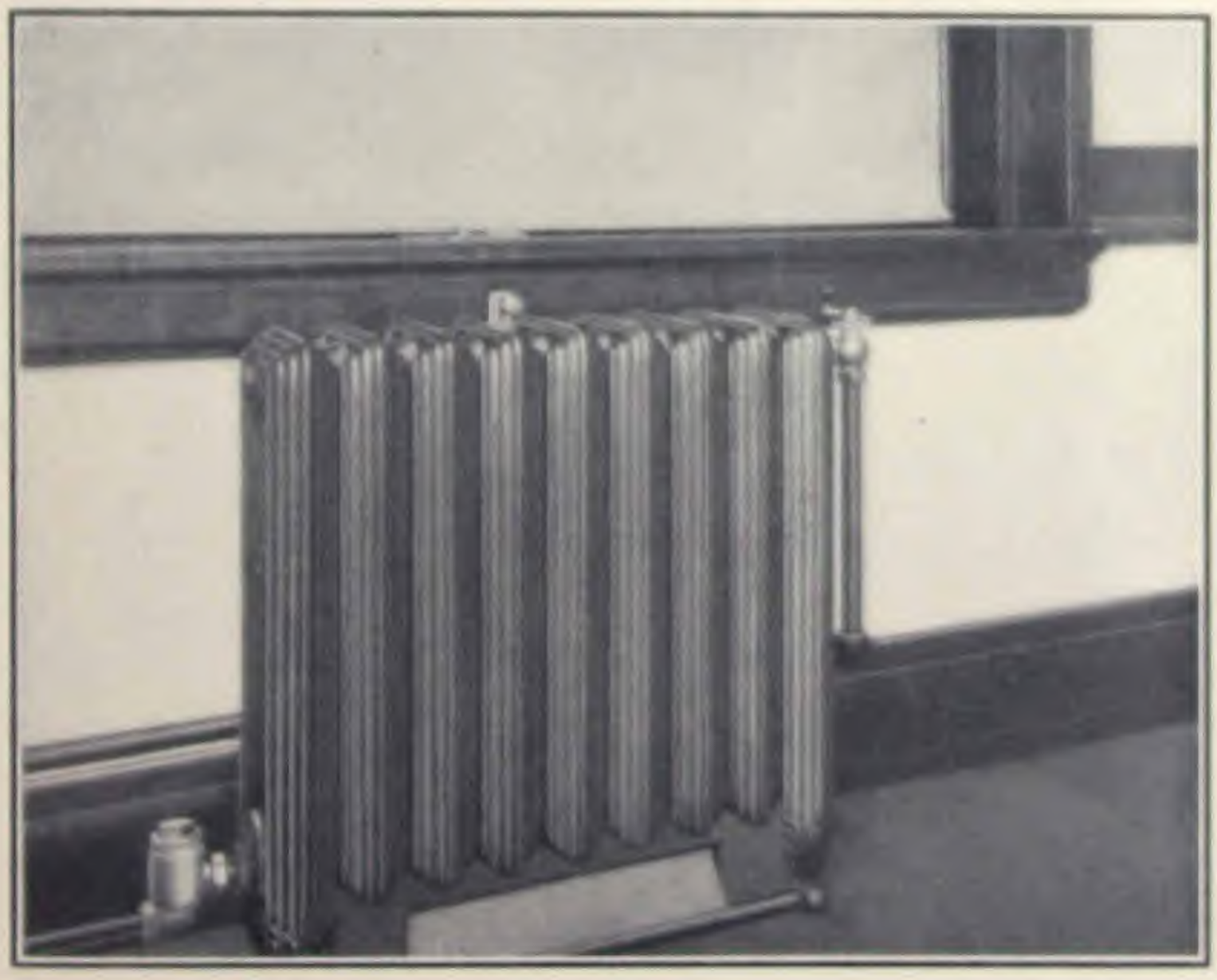
On the inlet end of each radiator is a standard Webster Modulation Valve and the discharge end is provided with a Webster Water Seal Motor. The latter automatically traps the water and air out of the radiator into the returns



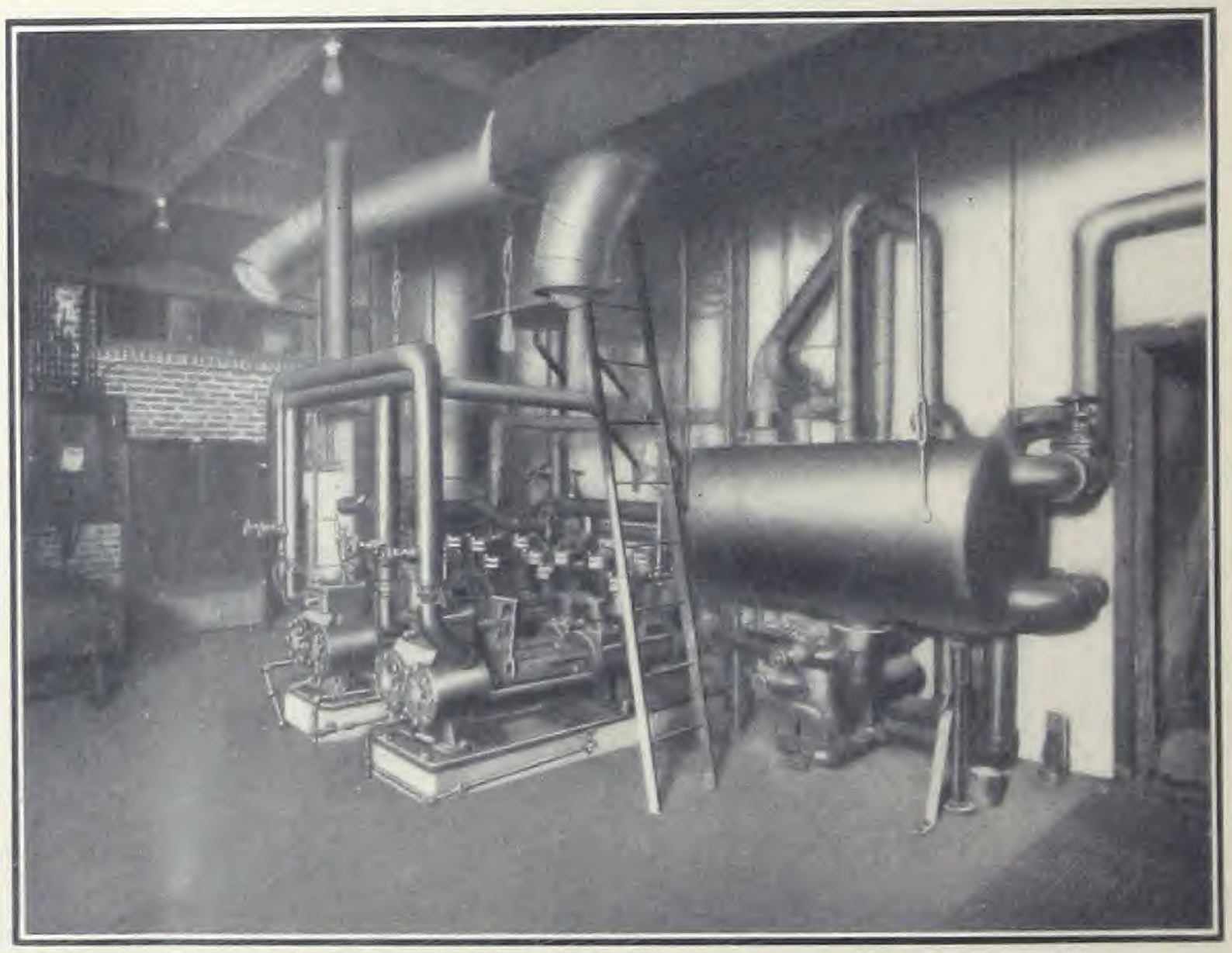
Plan of
Power Plant

and at the same time prevents the passage of uncondensed steam. The Modulation Valve is operated by hand and governs the amount of steam admitted to the radiator and consequently the amount of surface heated. By manipulating the handle of the Modulation Valve the occupant of each room is enabled to modulate the temperature to suit his own taste and the weather conditions. Backing up of water in the radiators is impossible because the return end of the radiator is sealed, and accordingly there is always obtained a positive steam flow regardless of the extent of opening of the Modulation Valve. This feature is the cause of a second advantage in the fact that it is unnecessary to carry a pressure in any point of the heating system of more than one pound. As a matter of fact, in this particular heating system it was not necessary at any time last winter to carry more than one half pound pressure, even during the most severe weather, and as a general thing, according to the engineer of the building, "You couldn't find the pressure on the gauge." The temperature regulation at the radiators has been at all times flexible and exact, and no trouble of any kind has been reported with the system.

Steam for all purposes is generated in three Heine 153 H.P. boilers at a pressure of 120 pounds. There are three Ameri-



can Ball engines direct connected to the three main generating sets, which supply the lighting of the building as well as the power for the fan motors and various other uses. Various auxiliary apparatus such as elevator pumps, boiler feed pumps, sump pumps, etc., also use steam from the boilers. All this apparatus exhausts into a main 10-inch exhaust header, from which two branches are taken to supply the respective heating systems—an eight-inch line to the tempering coil and reheater of the main fan system, and a ten-inch line to supply the Webster Modulation System. The risers for the latter vary in size from two to three inches and run to the top floor, branches being taken off at each story to supply the radiators on that floor. In order that either or both heating systems may be supplied with low pressure live steam direct from the boilers if necessary, both heating



mains are cross connected through reducing valves to the high pressure main steam line supplying the engines. The main exhaust header runs to a feed-water heater and is also connected to a free exhaust pipe leading through a back pressure valve to the roof.

A four-inch main return line in the boiler room receives the drips from all risers and also from the radiator returns,

which are vertical runs of pipe similar to the risers. These returns are all vented to the atmosphere. The main return line delivers to an automatic return tank located in the boiler room just above the boiler feed pumps. This tank receives returns from a three-inch return line which handles the condensation from the indirect heaters. The feed water pumps are supplied from this tank, a ball float and valve governing the entrance of make-up water. All risers and vertical returns are fitted with expansion joints at a point just above the third floor line, and are anchored to the steel framing of the building at two points.

The returns are sealed by inverted loops wherever they are carried on the walls above the water line. Concealed piping was in all cases subjected to a twenty-four hours' test for tightness under fifty pounds hydraulic pressure before being closed in.

This building has now been in use for about a year, and it has therefore been possible to observe the operation of the heating and ventilating equipment under every condition of weather and service. The indirect system and the air washer have given particular satisfaction in this installation, and the impression created upon entering the bank from the street is always of agreeable freshness and proper temperature. It has been possible at all times to modulate the temperature of each room to suit the weather conditions and the individual taste of the occupants by means of the Modulation System. To the bank officials it has been a matter of considerable interest to determine personally the efficiency of this system and also to ascertain the amount of cooling attainable in hot weather by means of the air washer. The results are reported to have been most satisfactory in every respect.

Among those who have contributed to the uniform success of this entire installation are the Engineers and Contractors, *Buerkel & Company, Boston, Mass.*, and the Manufacturers of the motor-driven fan and hot blast coils, *B. F. Sturtevant Co., Hyde Park, Mass.*

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